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JAPANESE [JP,09-023207,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE
INVENTION TECHNICAL PROBLEM MEANS OPERATION EXAMPLE DESCRIPTION OF
DRAWINGS DRAWINGS

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CLAIMS

[Claim(s)]

[Claim 1] The information multiplex system characterized by providing a means to hierarchize two or more information to the 1st information and 2nd information, respectively, a means to multiplex said two or more 1st information at a fixed rate, and the means that carries out code division multiplexing of said two or more 2nd information at an adjustable rate in the system which multiplexes two or more information, and is transmitted or accumulated.

[Claim 2] The information multiplex system characterized by providing further a means to control the transmitted power of each 2nd information, in an information multiplex system according to claim 1 according to the significance of each 2nd information.

[Claim 3] The information multiplex system characterized by to provide a means hierarchize two or more information to the 1st information and 2nd information, respectively, the means which carries out code division multiplexing of said two or more 1st information at a fixed rate, and the means which carries out code division multiplexing of said two or more 2nd information at an adjustable rate in the system which multiplexes two or more information, and is transmitted or accumulated.

[Claim 4] The information multiplex system with which the orthogonality of the 1st diffuse series which carries out code division multiplexing of the 1st information is characterized by being stronger than the orthogonality of the 2nd diffuse series which carries out code division multiplexing of the 2nd information in an information multiplex system according to claim 3.

[Claim 5] The information multiplex system characterized for the 1st information and 2nd information by the same or multiplexing in a different band in an information multiplex system according to claim 1 to 4.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the information multiplex system applied to for example, a CATV system etc.

[0002]

[Description of the Prior Art] The technique which carries out [the technique / voice / an image or] digital coding and is transmitted attracts attention with progress of a digital technique. The many channelization by high-efficiency-coding transmission which used the compression technology of digital signal processing in digitization of broadcast especially is effective, and the application to cable television, mobile television service, etc. is promising.

[0003] Drawing 5 is the example of the CATV structure of a system which applied such a technique. As shown in this drawing, the CATV cable 2 connected to the center 1 has branched at each home. Set top box 3a and 3b-- are connected to the end of the CATV cable 2 which branched at each home, respectively. Terminal unit 4a, such as TV set, and 4b-- are connected to each set top box 3a and 3b-- . In the end of the CATV cable 2, they are set top boxes 3a and 3b. -- The base station 5 is connected to others. A base station 5 forms a wireless circuit between the migration set top boxes 8 prepared in the mobiles 7, such as an automobile, through the antenna 6 formed in the base station 5. The terminal units 9, such as TV set, are connected to the migration set top box 8 like set top box 3a of the above-mentioned immobilization, and 3b--.

[0004] A center 1 sends out image data and audio data of M (for example, M= 100) channel through the CATV cable 2. Terminal unit 4a, such as TV set, and 4b-- take out and output the data of a desired channel among the above-mentioned image data or audio data from the CATV cable 2 through set top box 3a and 3b--.

[0005] A base station 5 is used as a base station for mobile broadcast. A base station 5 is changed into the signal which can broadcast the signal on the CATV cable 2, and is sent out to a mobile 7 through an antenna 6. The terminal units 9, such as TV set of a mobile 7, receive broadcast through the migration set top box 8.

[0006] There are the following troubles in such a CATV system. In such a system, the point that very big transmission capacity is required is mentioned to the 1st. Transmission of image information requires the information-transmission capacity of 2 - 5Mbps extent, in order to maintain the quality of the present television broadcasting average, even if it uses the newest compression technology considered by present. In addition, if it is going to acquire fixed quality, as shown in drawing 6 , according to the passage of time, a bit rate will be changed sharply. The phenomenon of fluctuation of this bit rate appears notably, when an image scene changes a lot (at the time of a scene change). For this reason, when it is going to acquire good image quality at the time of a scene change, several times as much transmission capacity as an average transmission rate is needed. For example, in the example of drawing 6 , twice [more than (4Mbps)] as many transmission capacity as an average transmission rate (1.5Mbps) is needed. This problem is serious especially in the system which offers multi-channel service using M above-mentioned channels. For example, in order to secure the quality of a peak period if the

image information to which a rate is changed is multiplexed to 100 channels as it was shown in drawing 6, when the transmission line in a CATV system considered as 1 bit/Hz (transmission capacity which is 1 bit per Hz), a peak rate \times transmission capacity \times channel = $4M \times 1 \text{ bit/Hz} \times 100\text{CH} = 400\text{MHz}$ band is needed. On the other hand, although it will end with a $1.5M \times 1 \text{ bit/Hz} \times 100\text{CH} = 150\text{MHz}$ band if it is the quality of an average rate, at the time of a scene change, quality will deteriorate greatly.

[0007] In the system which performs mobile communications to the 2nd as mentioned above, quality degradation called phasing poses a problem. That is, when a specific frequency component decreases greatly temporarily by phasing, the image of the channel which has a carrier in the frequency which decreased greatly in this way will be confused greatly at the time of frequency multiplex [which assigns and transmits many channels to a specific frequency].

[0008]

[Problem(s) to be Solved by the Invention] Thus, in the conventional CATV system, when it was going to maintain quality, very big transmission capacity was required, and there was a problem that quality deteriorated by phasing.

[0009] This invention was made in order to solve such a technical problem, and it aims at offering the information multiplex system which can stop a transmission rate low, maintaining fixed quality. Another purpose of this invention is offering the information multiplex system which can suppress degradation of the quality by phasing.

[0010]

[Means for Solving the Problem] In order to solve this technical problem, the information multiplex system of this invention according to claim 1 possesses a means to hierarchize two or more information to the 1st information and 2nd information, respectively, a means to multiplex said two or more 1st information at a fixed rate, and the means that carries out code division multiplexing of said two or more 2nd information at an adjustable rate in the system which multiplexes two or more information, and is transmitted or accumulated.

[0011] The information multiplex system of this invention according to claim 2 possesses further a means to control the transmitted power of each 2nd information, in an information multiplex system according to claim 1 according to the significance of each 2nd information.

[0012] The information multiplex system of this invention according to claim 3 possesses a means to hierarchize two or more information to the 1st information and 2nd information, respectively, the means which carries out code division multiplexing of said two or more 1st information at a fixed rate, and the means which carries out code division multiplexing of said two or more 2nd information at an adjustable rate in the system which multiplexes two or more information, and is transmitted or accumulated.

[0013] The information multiplex system of this invention according to claim 4 is characterized by the orthogonality of the 1st diffuse series which carries out code division multiplexing of the 1st information being stronger than the orthogonality of the 2nd diffuse series which carries out code division multiplexing of the 2nd information in an information multiplex system according to claim 3.

[0014] The information multiplex system of this invention according to claim 5 is characterized for the 1st information and 2nd information by the same or multiplexing in a different band in an information multiplex system according to claim 1 to 4.

[0015] In the above-mentioned means, information is for example, image information and a sound signal. The 1st information is basic information required for minimum quality maintenance for example, about image information. The 2nd information is upgrading information in which upgrading is possible by adding additional information to for example, basic information. Code division multiplexing is for example, a CDMA method.

[0016] This invention hierarchizes (1) information to basic information and upgrading information as mentioned above, and a fixed rate, then fixed quality can more specifically maintain basic information for the time being, (2) If many channels are multiplexed when adjustable rate coding of a video signal or the sound signal is carried out By probable dispersion of the peak rate of each channel, a deployment of a band can be aimed at using the statistical-multiplexing effectiveness that an average rate falls, (3) A CDMA (code division multi-access) method can

compare with a TDMA method etc., data multiplex can be realized more flexibly, and moreover adjustable rate-ization can be realized easily. Use, for example, image information is hierarchized to the upgrading information in which upgrading is possible by adding basic information required for minimum quality maintenance, and additional information. While carrying out CDMA multiplex transmission of the basic information at a fixed transmission rate among two or more image information hierarchized to basic information and upgrading information, at an adjustable transmission rate, CDMA multiplexing is carried out and upgrading information is transmitted to the same band as basic information.

[0017]

[Function] In this invention, since two or more information was hierarchized to the 1st information and 2nd information, respectively and two or more 1st information is multiplexed at the fixed rate, the fixed quality needed fundamentally will be maintained by this. Moreover, since code division multiplexing of two or more 2nd information is carried out at the adjustable rate, reduction-ization of the transmission rate by the statistical-multiplexing effectiveness can be attained. That is, since the basic information which is important information even if it is a time of considering image information, for example is a fixed transmission rate, the transmission rate after multiplexing is also known. For this reason, it is spread using a code with little (an orthogonality is strong) correlation between diffuse series, and indispensable image quality can be secured by carrying out CDMA multiplex, for example. On the other hand, upgrading information has low possibility that the peak of the image information to multiplex will lap even if some correlation is between diffuse series in order to carry out coding transmission at an adjustable transmission rate for example, (an orthogonality is weak), and there is little quality degradation and it ends. In addition, since the opposite side multiplicity is high (i.e., since the class of diffuse series increases), correspondence of saying [that an orthogonality is weak] is attained also at upgrading information with many classes.

[0018] Moreover, an informational error rate (quality) can be flexibly set as these by changing the transmitted power of each upgrading information according to significance. For example, what is necessary is just to set up transmitted power greatly about the upgrading information expected improvement in an error rate.

[0019] Furthermore, since it constitutes so that the basic information and upgrading information which carried out CDMA multiplexing may be multiplexed to the same band, it can be made to change flexibly only by changing the class of diffusion code which uses the rate of basic information and upgrading information for code division multiplex. Moreover, it is known that it is strong to phasing which is a trouble at the time of a radio transmission, and CDMA multiplex will serve as advantageous conditions, if this point also takes the communication link with a mobile into consideration.

[0020]

[Example] Hereafter, the detail of the example of this invention is explained based on a drawing. Drawing 1 is the block diagram showing the configuration of the sending set in the system concerning one example of this invention. This sending set is arranged in the center 1 in the system shown in drawing 5.

[0021] Hierarchization section 111-12N-1 to which the sending set shown in this drawing hierarchizes two or more image information to the basic information on one fixed rate, and the upgrading information on four adjustable rates, respectively, CDMA diffusion section 121-12N-1 which carries out CDMA diffusion of each hierarchized information (the thing of arbitration is set to 12i.) the CDMA diffusion section 120 which carries out CDMA diffusion of the synchronization information -- each -- it has the signal adder unit 13 which adds and multiplexes the output of CDMA diffusion section 120-12N-1. The signal adder unit 13 is connected to a cable 14.

[0022] Each CDMA diffusion section 12i is equipped with diffuse series v_i , the direct diffusion-process sections 151-155 spread by diffuse series w_{i1} - w_{i4} to each upgrading information, respectively, the modulation sections 161-165 which modulate the diffused information and make a cable and a radio transmission possible, the adjustable gain sections 171-175 which adjust power based on the importance of each information, and the adder 18 which add each diffusion signal to the last to basic information.

[0023] The CDMA diffusion section 120 is equipped with the direct diffusion-process section 19 spread by diffuse series v0 to synchronization information, the modulation section 20 which modulates the diffused information and makes a cable and a radio transmission possible, and the amplifier 21 which amplifies this modulation information to fixed power.

[0024] each image information is hierarchized to each basic information and upgrading information by hierarchization section 111-11N-1 -- having -- each -- it is inputted into CDMA diffusion section 121-12N-1. Here, the i-th image information consists of upgrading information xi1-xi4 adjustable by the basic information xi0 and 1Mbps of a fixed rate (for example, 1Mbps). Upgrading information changes [to], when it does not exist (0bps) and all information occurs from from by the adjustable rate nature of image information (4Mbps).

[0025] In such image information, the basic information which is information indispensable in order to secure quality is diffused 128 times (128Mbps) in diffuse series vi in the direct diffusion-process section 151. On the other hand, the upgrading information xi1-xi4 is diffused 128 times (0 - 128Mbps) in diffuse series wi1-wi4 in the direct diffusion-process sections 152-155.

[0026] Here, diffuse series vi is an orthogonality strong sequence, and although diffuse series wi1-wi4 are compared with diffuse series vi and an orthogonality is weak, it is a sequence with a high multiplicity. That is, it considers as $w_i T w_j = \alpha$ $i j w_i T w_j = \beta$ $i j w_i T w_j = \gamma$ $i j$,

$$\alpha_{\max} = \max_{i \neq j} [\alpha_{ij}]$$

$$\beta_{\max} = \max_{i \neq j} [\beta_{ij}]$$

$$\gamma_{\max} = \max_{i \neq j} [\gamma_{ij}]$$

但し、 $\max_{i \neq j} [A_{ij}]$ は $i \neq j$ なる全ての A_{ij} における最大値とする。

Moreover, alphamax, betamax, and gammamax It considers as the sequence which has the property which becomes alphamax << gammamax < betamax.

[0027] Thus, in the modulation sections 161-165, it becomes irregular so that a cable and a radio transmission may be possible, and in the adjustable gain sections 171-175, each transmitted power is adjusted based on the importance of each information, and the diffused information is added in an adder 18.

[0028] With the diffusion and the modulating signal concerning the synchronization information outputted from the CDMA diffusion section 120, the image information on N-1-kind ** in which CDMA diffusion was carried out by the above processing is added by the signal adder unit 13, and is outputted from a cable 14.

[0029] The configuration of the receiver by the side of the user who, on the other hand, receives the information diffused in this way in drawing 2 is shown. That is, as shown in this drawing, it gets over by the recovery sections 221-226, and the image information on the diffused various kinds inputted from the cable 14 is decoded using the back-diffusion-of-electrons sequences vi, wi1-wi4 of a user proper, and v0 in the back-diffusion-of-electrons sections 231-236.

[0030] The upgrading information by which the back diffusion of electrons was carried out by the basic information and diffuse series wi1-wi4 by which the back diffusion of electrons was carried out by diffuse series vi among these decode signals is decoded with the hierarchized image encoder 24, and serves as the desired image 25.

[0031] Moreover, the synchronization information (timing information) by which the back diffusion of electrons was carried out by the back-diffusion-of-electrons sequence v0 is used in order to adjust the timing of the whole receiver. By the above processing, as shown in drawing 3, flexible multiplexing of the basic information on the same band W and upgrading information is attained.

[0032] in addition, although basic information and upgrading information were made into the same band in the example mentioned above, when allowances are in a band, it is also possible to divide into a band which is alike and different as shown in drawing 4. Here, basic information is Band WB. Multiplexing transmission is set and carried out and upgrading information is Band WE. Multiplexing transmission is set and carried out. In this case, since diffuse series with a high

multiplicity is used for upgrading information, it may be able to transmit image information all over bands fewer than basic information.

[0033] Moreover, it is also possible by employing the description of CDMA efficiently to share the existing broadcast wave and a band. As such an example, basic information is multiplexed by the conventional Time-Division-Multiplexing (TDMA) method, and it is possible to carry out CDMA multiplexing only of the upgrading information, and is in the range of this invention also in this case.

[0034] Furthermore, in the example mentioned above, although image information was explained to the example, if it is the information which can be hierarchized, voice can apply this invention similarly. Moreover, although the communication link was made into the example and the example mentioned above explained, also when accumulating information, of course, this invention can be applied.

[0035]

[Effect of the Invention] As explained in full detail above, according to this invention, the fixed quality needed fundamentally can be maintained and reduction-ization of the transmission rate by the statistical-multiplexing effectiveness can be attained.

[0036] Moreover, an informational error rate (quality) can be flexibly set as these by changing the transmitted power of each upgrading information according to significance. Furthermore, it can be made to change flexibly only by changing the class of diffusion code which uses the rate of basic information and upgrading information for code division multiplex. Moreover, it is strong to phasing at the time of a radio transmission, and becomes conditions advantageous to mobile communications.

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TECHNICAL FIELD

[Industrial Application] This invention relates to the information multiplex system applied to for example, a CATV system etc.

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PRIOR ART

[Description of the Prior Art] The technique which carries out [the technique / voice / an image or] digital coding and is transmitted attracts attention with progress of a digital technique. The many channelization by high-efficiency-coding transmission which used the compression technology of digital signal processing in digitization of broadcast especially is effective, and the application to cable television, mobile television service, etc. is promising.

[0003] Drawing 5 is the example of the CATV structure of a system which applied such a technique. As shown in this drawing, the CATV cable 2 connected to the center 1 has branched at each home. Set top box 3a and 3b— are connected to the end of the CATV cable 2 which branched at each home, respectively. Terminal unit 4a, such as TV set, and 4b— are connected to each set top box 3a and 3b—. In the end of the CATV cable 2, they are set top boxes 3a and 3b. — The base station 5 is connected to others. A base station 5 forms a wireless circuit between the migration set top boxes 8 prepared in the mobiles 7, such as an automobile, through the antenna 6 formed in the base station 5. The terminal units 9, such as TV set, are connected to the migration set top box 8 like set top box 3a of the above-mentioned immobilization, and 3b—.

[0004] A center 1 sends out image data and audio data of M (for example, M= 100) channel through the CATV cable 2. Terminal unit 4a, such as TV set, and 4b— take out and output the data of a desired channel among the above-mentioned image data or audio data from the CATV cable 2 through set top box 3a and 3b—.

[0005] A base station 5 is used as a base station for mobile broadcast. A base station 5 is changed into the signal which can broadcast the signal on the CATV cable 2, and is sent out to a mobile 7 through an antenna 6. The terminal units 9, such as TV set of a mobile 7, receive broadcast through the migration set top box 8.

[0006] There are the following troubles in such a CATV system. In such a system, the point that very big transmission capacity is required is mentioned to the 1st. Transmission of image information requires the information-transmission capacity of 2 - 5Mbps extent, in order to maintain the quality of the present television broadcasting average, even if it uses the newest compression technology considered by present. In addition, if it is going to acquire fixed quality, as shown in drawing 6 , according to the passage of time, a bit rate will be changed sharply. The phenomenon of fluctuation of this bit rate appears notably, when an image scene changes a lot (at the time of a scene change). For this reason, when it is going to acquire good image quality at the time of a scene change, several times as much transmission capacity as an average transmission rate is needed. For example, in the example of drawing 6 , twice [more than (4Mbps)] as many transmission capacity as an average transmission rate (1.5MBPS) is needed. This problem is serious especially in the system which offers multi-channel service using M above-mentioned channels. For example, in order to secure the quality of a peak period if the image information to which a rate is changed is multiplexed to 100 channels as it was shown in drawing 6 , when the transmission line in a CATV system considered as 1 bit/Hz (transmission capacity which is 1 bit per Hz), a peak rate x transmission capacity x channel =4Mx1 bit/Hzx100CH=400MHz band is needed. On the other hand, although it will end with a 1.5Mx1 bit/Hzx100CH=150MHz band if it is the quality of an average rate, at the time of a scene change,

quality will deteriorate greatly.

[0007] In the system which performs mobile communications to the 2nd as mentioned above, quality degradation called phasing poses a problem. That is, when a specific frequency component decreases greatly temporarily by phasing, the image of the channel which has a carrier in the frequency which decreased greatly in this way will be confused greatly at the time of frequency multiplex [which assigns and transmits many channels to a specific frequency].

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained in full detail above, according to this invention, the fixed quality needed fundamentally can be maintained and reduction-ization of the transmission rate by the statistical-multiplexing effectiveness can be attained.

[0036] Moreover, an informational error rate (quality) can be flexibly set as these by changing the transmitted power of each upgrading information according to significance. Furthermore, it can be made to change flexibly only by changing the class of diffusion code which uses the rate of basic information and upgrading information for code division multiplex. Moreover, it is strong to phasing at the time of a radio transmission, and becomes conditions advantageous to mobile communications.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Thus, in the conventional CATV system, when it was going to maintain quality, very big transmission capacity was required, and there was a problem that quality deteriorated by phasing.

[0009] This invention was made in order to solve such a technical problem, and it aims at offering the information multiplex system which can stop a transmission rate low, maintaining fixed quality. Another purpose of this invention is offering the information multiplex system which can suppress degradation of the quality by phasing.

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MEANS

[Means for Solving the Problem] In order to solve this technical problem, the information multiplex system of this invention according to claim 1 possesses a means to hierarchize two or more information to the 1st information and 2nd information, respectively, a means to multiplex said two or more 1st information at a fixed rate, and the means that carries out code division multiplexing of said two or more 2nd information at an adjustable rate in the system which multiplexes two or more information, and is transmitted or accumulated.

[0011] The information multiplex system of this invention according to claim 2 possesses further a means to control the transmitted power of each 2nd information, in an information multiplex system according to claim 1 according to the significance of each 2nd information.

[0012] The information multiplex system of this invention according to claim 3 possesses a means to hierarchize two or more information to the 1st information and 2nd information, respectively, the means which carries out code division multiplexing of said two or more 1st information at a fixed rate, and the means which carries out code division multiplexing of said two or more 2nd information at an adjustable rate in the system which multiplexes two or more information, and is transmitted or accumulated.

[0013] The information multiplex system of this invention according to claim 4 is characterized by the orthogonality of the 1st diffuse series which carries out code division multiplexing of the 1st information being stronger than the orthogonality of the 2nd diffuse series which carries out code division multiplexing of the 2nd information in an information multiplex system according to claim 3.

[0014] The information multiplex system of this invention according to claim 5 is characterized for the 1st information and 2nd information by the same or multiplexing in a different band in an information multiplex system according to claim 1 to 4.

[0015] In the above-mentioned means, information is for example, image information and a sound signal. The 1st information is basic information required for minimum quality maintenance for example, about image information. The 2nd information is upgrading information in which upgrading is possible by adding additional information to for example, basic information. Code division multiplexing is for example, a CDMA method.

[0016] This invention hierarchizes (1) information to basic information and upgrading information as mentioned above, and a fixed rate, then fixed quality can more specifically maintain basic information for the time being, (2) If many channels are multiplexed when adjustable rate coding of a video signal or the sound signal is carried out By probable dispersion of the peak rate of each channel, a deployment of a band can be aimed at using the statistical-multiplexing effectiveness that an average rate falls, (3) A CDMA (code division multi-access) method can compare with a TDMA method etc., data multiplex can be realized more flexibly, and moreover adjustable rate-ization can be realized easily, Use, for example, image information is hierarchized to the upgrading information in which upgrading is possible by adding basic information required for minimum quality maintenance, and additional information. While carrying out CDMA multiplex transmission of the basic information at a fixed transmission rate among two or more image information hierarchized to basic information and upgrading information, at an adjustable transmission rate, CDMA multiplexing is carried out and upgrading information is transmitted to

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OPERATION

[Function] In this invention, since two or more information was hierarchized to the 1st information and 2nd information, respectively and two or more 1st information is multiplexed at the fixed rate, the fixed quality needed fundamentally will be maintained by this. Moreover, since code division multiplexing of two or more 2nd information is carried out at the adjustable rate, reduction-ization of the transmission rate by the statistical-multiplexing effectiveness can be attained. That is, since the basic information which is important information even if it is a time of considering image information, for example is a fixed transmission rate, the transmission rate after multiplexing is also known. For this reason, it is spread using a code with little (an orthogonality is strong) correlation between diffuse series, and indispensable image quality can be secured by carrying out CDMA multiplex, for example. On the other hand, upgrading information has low possibility that the peak of the image information to multiplex will lap even if some correlation is between diffuse series in order to carry out coding transmission at an adjustable transmission rate for example, (an orthogonality is weak), and there is little quality degradation and it ends. In addition, since the opposite side multiplicity is high (i.e., since the class of diffuse series increases), correspondence of saying [that an orthogonality is weak] is attained also at upgrading information with many classes.

[0018] Moreover, an informational error rate (quality) can be flexibly set as these by changing the transmitted power of each upgrading information according to significance. For example, what is necessary is just to set up transmitted power greatly about the upgrading information expected improvement in an error rate.

[0019] Furthermore, since it constitutes so that the basic information and upgrading information which carried out CDMA multiplexing may be multiplexed to the same band, it can be made to change flexibly only by changing the class of diffusion code which uses the rate of basic information and upgrading information for code division multiplex. Moreover, it is known that it is strong to phasing which is a trouble at the time of a radio transmission, and CDMA multiplex will serve as advantageous conditions, if this point also takes the communication link with a mobile into consideration.

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EXAMPLE

[Example] Hereafter, the detail of the example of this invention is explained based on a drawing. Drawing 1 is the block diagram showing the configuration of the sending set in the system concerning one example of this invention. This sending set is arranged in the center 1 in the system shown in drawing 5.

[0021] Hierarchization section 111-12N-1 to which the sending set shown in this drawing hierarchizes two or more image information to the basic information on one fixed rate, and the upgrading information on four adjustable rates, respectively, CDMA diffusion section 121-12N-1 which carries out CDMA diffusion of each hierarchized information (the thing of arbitration is set to 12i.) the CDMA diffusion section 120 which carries out CDMA diffusion of the synchronization information — each — it has the signal adder unit 13 which adds and multiplexes the output of CDMA diffusion section 120-12N-1. The signal adder unit 13 is connected to a cable 14.

[0022] Each CDMA diffusion section 12i is equipped with diffuse series vi, the direct diffusion-process sections 151-155 spread by diffuse series wi1-wi4 to each upgrading information, respectively, the modulation sections 161-165 which modulate the diffused information and make a cable and a radio transmission possible, the adjustable gain sections 171-175 which adjust power based on the importance of each information, and the adder 18 which add each diffusion signal to the last to basic information.

[0023] The CDMA diffusion section 120 is equipped with the direct diffusion-process section 19 spread by diffuse series v0 to synchronization information, the modulation section 20 which modulates the diffused information and makes a cable and a radio transmission possible, and the amplifier 21 which amplifies this modulation information to fixed power.

[0024] each image information is hierarchized to each basic information and upgrading information by hierarchization section 111-11N-1 — having — each — it is inputted into CDMA diffusion section 121-12N-1. Here, the i-th image information consists of upgrading information xi1-xi4 adjustable by the basic information xi0 and 1Mbps of a fixed rate (for example, 1Mbps). Upgrading information changes [to], when it does not exist (0bps) and all information occurs from from by the adjustable rate nature of image information (4Mbps).

[0025] In such image information, the basic information which is information indispensable in order to secure quality is diffused 128 times (128Mbps) in diffuse series vi in the direct diffusion-process section 151. On the other hand, the upgrading information xi1-xi4 is diffused 128 times (0 - 128Mbps) in diffuse series wi1-wi4 in the direct diffusion-process sections 152-155.

[0026] Here, diffuse series vi is an orthogonality strong sequence, and although diffuse series wi1-wi4 are compared with diffuse series vi and an orthogonality is weak, it is a sequence with a high multiplicity. That is, it considers as $w_i T w_j = \alpha$ $i j w_i T w_j = \beta$ $i j w_i T w_j = \gamma$ $i j$,

$$\alpha_{\max} = \max_{i \neq j} [\alpha_{i,j}]$$

$$\beta_{\max} = \max_{i \neq j} [\beta_{i,j}]$$

$$\gamma_{\max} = \max_{i \neq j} [\gamma_{i,j}]$$

但し、 $\max_{i \neq j} [A_{i,j}]$ は $i \neq j$ なる全ての $A_{i,j}$ における最大値とする。

Moreover, alphamax, betamax, and gammamax It considers as the sequence which has the property which becomes alphamax <<gammamax <betamax.

[0027] Thus, in the modulation sections 161-165, it becomes irregular so that a cable and a radio transmission may be possible, and in the adjustable gain sections 171-175, each transmitted power is adjusted based on the importance of each information, and the diffused information is added in an adder 18.

[0028] With the diffusion and the modulating signal concerning the synchronization information outputted from the CDMA diffusion section 120, the image information on N-1-kind ** in which CDMA diffusion was carried out by the above processing is added by the signal adder unit 13, and is outputted from a cable 14.

[0029] The configuration of the receiver by the side of the user who, on the other hand, receives the information diffused in this way in drawing 2 is shown. That is, as shown in this drawing, it gets over by the recovery sections 221-226, and the image information on the diffused various kinds inputted from the cable 14 is decoded using the back-diffusion-of-electrons sequences v_i , w_{i1} - w_{i4} of a user proper, and v_0 in the back-diffusion-of-electrons sections 231-236.

[0030] The upgrading information by which the back diffusion of electrons was carried out by the basic information and diffuse series w_{i1} - w_{i4} by which the back diffusion of electrons was carried out by diffuse series v_i among these decode signals is decoded with the hierarchized image encoder 24, and serves as the desired image 25.

[0031] Moreover, the synchronization information (timing information) by which the back diffusion of electrons was carried out by the back-diffusion-of-electrons sequence v_0 is used in order to adjust the timing of the whole receiver. By the above processing, as shown in drawing 3, flexible multiplexing of the basic information on the same band W and upgrading information is attained.

[0032] in addition, although basic information and upgrading information were made into the same band in the example mentioned above, when allowances are in a band, it is also possible to divide into a band which is alike and different as shown in drawing 4. Here, basic information is Band WB. Multiplexing transmission is set and carried out and upgrading information is Band WE. Multiplexing transmission is set and carried out. In this case, since diffuse series with a high multiplicity is used for upgrading information, it may be able to transmit image information all over bands fewer than basic information.

[0033] Moreover, it is also possible by employing the description of CDMA efficiently to share the existing broadcast wave and a band. As such an example, basic information is multiplexed by the conventional Time-Division-Multiplexing (TDMA) method, and it is possible to carry out CDMA multiplexing only of the upgrading information, and is in the range of this invention also in this case.

[0034] Furthermore, in the example mentioned above, although image information was explained to the example, if it is the information which can be hierarchized, voice can apply this invention similarly. Moreover, although the communication link was made into the example and the example mentioned above explained, also when accumulating information, of course, this invention can be applied.

[Translation done.]

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the configuration of the sending set in the system concerning one example of this invention.

[Drawing 2] It is the block diagram showing the configuration of the receiving set in the system concerning one example of this invention.

[Drawing 3] It is drawing showing the example which multiplexed basic information and upgrading information to the same band.

[Drawing 4] It is drawing showing the example which multiplexed basic information and upgrading information to a different band.

[Drawing 5] It is drawing showing the example of the CATV structure of a system.

[Drawing 6] It is drawing for explaining fluctuation of the bit rate at the time of a scene change.

[Description of Notations]

111-11N-1 -- Hierarchization section

121-12N-1 -- CDMA diffusion section

13 Signal adder unit

151-155 Direct diffusion-process section

161-165 Modulation section

171-175 Adjustable gain section

18 Adder

[Translation done.]

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(71) 出願人 000003078

株式会社東芝

神奈川県川崎市幸区堀川町72番地

(72) 発明者 南 重信

神奈川県川崎市幸区柳町70番地 株式会社

東芝柳町工場内

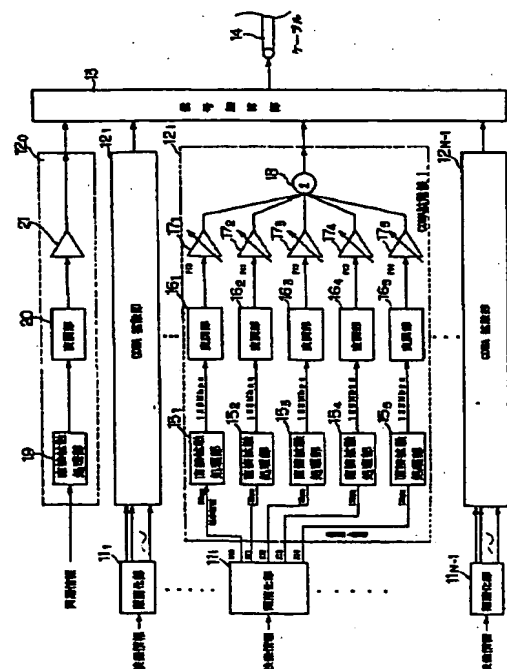
(74) 代理人 弁理士 則近 憲佑

(54) 【発明の名称】 情報多重化方式

(57) 【要約】

【目的】 一定の品質を維持しながら伝送レートを低く抑えること。

【構成】 複数の映像情報を固定レートの基本情報と可変レートの品質向上情報とに階層化する階層化部11、 $\sim 11_{n-1}$ と、階層化された各情報をCDMA拡散するCDMA拡散部12、 $\sim 12_{n-1}$ (任意のものを12、とする。)と、各CDMA拡散部12、 $\sim 12_{n-1}$ の出力を加算して多重化する信号加算部13とを備え、各CDMA拡散部12、は、基本情報に対しては拡散系列 v_i 、各品質向上情報に対してはそれぞれ拡散系列 $w_{i1} \sim w_{i4}$ で拡散を行う直接拡散処理部15、 $\sim 15_4$ と、拡散した情報を変調してケーブルや無線伝送を可能にする変調部16、 $\sim 16_4$ と、各々の情報の重要性に基づいて電力を調整する可変利得部17、 $\sim 17_4$ と、最後に各拡散信号を加算する加算器18とを備える。



1

【特許請求の範囲】

【請求項1】 複数の情報を多重化して送信または蓄積するシステムにおいて、

複数の情報をそれぞれ第1の情報と第2の情報とに階層化する手段と、

前記複数の第1の情報を固定レートで多重化する手段と、

前記複数の第2の情報を可変レートでコード分割多重化する手段とを具備することを特徴とする情報多重化方式。

【請求項2】 請求項1記載の情報多重化方式において、

各第2の情報の重要度に応じて、各第2の情報の送信電力を制御する手段をさらに具備することを特徴とする情報多重化方式。

【請求項3】 複数の情報を多重化して送信または蓄積するシステムにおいて、

複数の情報をそれぞれ第1の情報と第2の情報とに階層化する手段と、

前記複数の第1の情報を固定レートでコード分割多重化する手段と、

前記複数の第2の情報を可変レートでコード分割多重化する手段とを具備することを特徴とする情報多重化方式。

【請求項4】 請求項3記載の情報多重化方式において、

第1の情報をコード分割多重化する第1の拡散系列の直交性が、第2の情報をコード分割多重化する第2の拡散系列の直交性よりも強いことを特徴とする情報多重化方式。

【請求項5】 請求項1～4のいずれかに記載の情報多重化方式において、

第1の情報と第2の情報とを同一または異なる帯域で多重化することを特徴とする情報多重化方式。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、例えばCATVシステム等に適用される情報多重化方式に関する。

【0002】

【従来の技術】 デジタル技術の進展に伴い、映像や音声をデジタル符号化して伝送する技術が注目されている。特に、放送のデジタル化においては、デジタル信号処理の圧縮技術を利用した高能率符号化伝送による多チャンネル化が有効であり、ケーブルテレビや移動体テレビサービス等への応用が将来有望である。

【0003】 図5はこのような技術を適用したCATVシステムの構成例である。同図に示すように、センタ1に接続されたCATVケーブル2は、各家庭に分岐されている。各家庭に分岐されたCATVケーブル2の末端には、それぞれセットトップボックス3a、3b…が接

2

続されている。各セットトップボックス3a、3b…には、例えばTVセット等の端末装置4a、4b…が接続されている。CATVケーブル2の末端には、セットトップボックス3a、3b…の他に、基地局5が接続されている。基地局5は、基地局5に設けられたアンテナ6を介して自動車等の移動体7に設けられた移動セットトップボックス8との間で無線回線を形成する。移動セットトップボックス8には、上記の固定のセットトップボックス3a、3b…と同様に、例えばTVセット等の端末装置9が接続されている。

【0004】 センタ1は、M（例えばM=100）チャンネルの映像データやオーディオデータをCATVケーブル2を介して送出する。TVセット等の端末装置4a、4b…は、セットトップボックス3a、3b…を介してCATVケーブル2より上記の映像データやオーディオデータのうち所望のチャンネルのデータを取り出し、出力する。

【0005】 基地局5は、移動体放送用の基地局として用いられる。基地局5は、CATVケーブル2上の信号を無線放送可能な信号に変換し、アンテナ6を介して移動体7に送出する。移動体7のTVセット等の端末装置9は、移動セットトップボックス8を介して無線放送を受信する。

【0006】 このようなCATVシステムにおいては、次のような問題点がある。第1に、このようなシステムでは、極めて大きな伝送能力が要求される点が挙げられる。映像情報の伝送では、現行で考えられる最新の圧縮技術を用いても、現行のテレビジョン放送並の品質を維持するためには、2～5Mbps程度の情報伝送能力が

要求される。加えて、一定の品質を得ようすると、図6に示すように、時間の経過に従ってビットレートが大きく変動する。このビットレートの変動の現象は、映像シーンが大きく変化したとき（シーンチェンジ時）に顕著に現れる。このためシーンチェンジ時においても良好な画像品質を得ようすると、平均伝送レートの数倍の伝送能力が必要となる。例えば、図6の例では、平均伝送レート（1.5Mbps）の2倍以上（4Mbps）の伝送能力が必要となる。この問題は、上述のMチャンネルを使って多チャンネルサービスを提供するシステムにおいては特に深刻である。例えばCATVシステムにおける伝送路が1bit/Hz（1Hzあたり1bitの伝送能力）とすると、図6に示したようにレートが変動する映像情報を100チャンネルに多重化すると、ピーク時の品質を確保するには、

$$\begin{aligned} & \text{ピークレート} \times \text{伝送能力} \times \text{チャンネル} \\ &= 4\text{M} \times 1\text{bit}/\text{Hz} \times 100\text{CH} \\ &= 400\text{MHz} \end{aligned}$$

の帯域が必要となる。一方、平均レートの品質であれば、

$$1.5\text{M} \times 1\text{bit}/\text{Hz} \times 100\text{CH} = 150\text{MHz}$$

の帯域で済むが、シーンチェンジ時には品質が大きく劣化してしまう。

【0007】第2に、上記のように移動体通信を行うシステムでは、フェージングと呼ばれる品質劣化が問題となる。すなわち、フェージングにより特定の周波数成分が一時的に大きく減少すると、多チャンネルを特定の周波数に割り当てて伝送する周波数多重時には、このように大きく減少したところの周波数にキャリアを持つチャンネルの映像が大きく乱れることになる。

【0008】

【発明が解決しようとする課題】このように従来のCATVシステムにおいては、品質を維持しようとするとき極めて大きな伝送能力が要求され、またフェージングにより品質が劣化するという問題があった。

【0009】本発明は、このような課題を解決するためになされたもので、一定の品質を維持しながら伝送レートを低く抑えることができる情報多重化方式を提供することを目的としている。本発明の別の目的は、フェージングによる品質の劣化を抑えることができる情報多重化方式を提供することである。

【0010】

【課題を解決するための手段】かかる課題を解決するため、請求項1記載の本発明の情報多重化方式は、複数の情報を多重化して送信または蓄積するシステムにおいて、複数の情報をそれぞれ第1の情報と第2の情報とに階層化する手段と、前記複数の第1の情報を固定レートで多重化する手段と、前記複数の第2の情報を可変レートでコード分割多重化する手段とを具備する。

【0011】請求項2記載の本発明の情報多重化方式は、請求項1記載の情報多重化方式において、各第2の情報の重要度に応じて、各第2の情報の送信電力を制御する手段をさらに具備する。

【0012】請求項3記載の本発明の情報多重化方式は、複数の情報を多重化して送信または蓄積するシステムにおいて、複数の情報をそれぞれ第1の情報と第2の情報とに階層化する手段と、前記複数の第1の情報を固定レートでコード分割多重化する手段と、前記複数の第2の情報を可変レートでコード分割多重化する手段とを具備する。

【0013】請求項4記載の本発明の情報多重化方式は、請求項3記載の情報多重化方式において、第1の情報をコード分割多重化する第1の拡散系列の直交性が、第2の情報をコード分割多重化する第2の拡散系列の直交性よりも強いことを特徴とする。

【0014】請求項5記載の本発明の情報多重化方式は、請求項1～4のいずれかに記載の情報多重化方式において、第1の情報と第2の情報とを同一または異なる帯域で多重化することを特徴とする。

【0015】上記の手段において、情報とは、例えば映像情報や音声信号のことである。第1の情報とは、例え

ば映像情報を最低限の品質維持に必要な基本情報のことである。第2の情報とは、例えば基本情報に付加的な情報を加えることにより品質向上が可能な品質向上情報のことである。コード分割多重化とは、例えばCDMA方式のことである。

【0016】より具体的には、本発明は、(1)情報を上記のように基本情報と品質向上情報とに階層化し、基本情報を固定レートとすれば取り敢えず一定の品質が維持できること、(2)映像信号や音声信号を可変レート符号化したときに多チャンネルを多重化すれば、各チャンネルのピークレートの確率的なばらつきにより、平均レートが低下する統計的多重化効果を利用して帯域の有効利用が図れること、(3)CDMA(コード分割多重アクセス)方式がTDMA方式等に比しデータ多重をより柔軟に実現でき、しかも可変レート化を容易に実現できること、を利用して、例えば映像情報を最低限の品質維持に必要な基本情報と付加的な情報を加えることにより品質向上が可能な品質向上情報とに階層化し、基本情報と品質向上情報とに階層化した複数の映像情報のうち、基本情報を固定伝送レートでCDMA多重伝送するとともに、品質向上情報を可変伝送レートで基本情報と同一の帯域にCDMA多重化して伝送するものである。

【0017】

【作用】本発明では、複数の情報をそれぞれ第1の情報と第2の情報とに階層化し、複数の第1の情報を固定レートで多重化しているので、基本的に必要とされる一定の品質がこれにより維持されることになる。また、複数の第2の情報を可変レートでコード分割多重化しているので、統計的多重化効果による伝送レートの低減化を図ることができる。すなわち、例えば映像情報を考えたときであっても重要な情報である基本情報は、固定伝送レートなので多重化後の伝送レートも既知である。このため、例えば拡散系列間の相関の少ない(直交性が強い)コードを用いて拡散してCDMA多重することにより、最低限必要な映像品質は確保できる。一方、品質向上情報は、可変伝送レートで符号化伝送するため、例えば拡散系列間に若干の相関があっても(直交性が弱い)、多重化する映像情報のピークが重なる可能性が低く、品質劣化が少なくて済む。なお、直交性が弱いということ

は、反面多重度が高いので、すなわち拡散系列の種類が多くなるので、種類の多い品質向上情報にも対応が可能となる。

【0018】また、重要度に応じて各品質向上情報の送信電力を変化させることにより、これらに情報の誤り率(品質)を柔軟に設定することができる。例えば、誤り率の向上が望まれる品質向上情報については送信電力を大きく設定すればよい。

【0019】さらに、CDMA多重化した基本情報と品質向上情報とを同一の帯域に多重化するように構成しているため、基本情報と品質向上情報との割合をコード分

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割多重に用いる拡散コードの種類を変化させるだけで柔軟に変化させることができる。また、CDMA多重は、無線伝送時の問題点であるフェージングに強いことが知られており、この点も移動体との通信を考慮すると有利な条件となる。

【0020】

【実施例】以下、本発明の実施例の詳細を図面に基づき説明する。図1は本発明の一実施例に係るシステムにおける送信装置の構成を示すブロック図である。この送信装置は、例えば図5に示したシステムにおけるセンタ1

【0021】同図に示す送信装置は、複数の映像情報をそれぞれ1つの固定レートの基本情報と4つの可変レートの品質向上情報とに階層化する階層化部11₁～12_{n-1}と、階層化された各情報をCDMA拡散するCDMA拡散部12₁～12_{n-1}（任意のものを12₁とする。）と、同期情報をCDMA拡散するCDMA拡散部12_nと、各CDMA拡散部12₁～12_{n-1}の出力を加算して多重化する信号加算部13とを備える。信号加算部13は、ケーブル14に接続される。

【0022】各CDMA拡散部12_iは、基本情報に対しては拡散系列 v_i 、各品質向上情報に対してはそれぞれ拡散系列 $w_{i1} \sim w_{i4}$ で拡散を行う直接拡散処理部15₁～15₄と、拡散した情報を変調してケーブルや無線伝送を可能にする変調部16₁～16₄と、各々の情報の重要性に基づいて電力を調整する可変利得部17₁～17₄と、最後に各拡散信号を加算する加算器18とを備える。

$$\alpha_{max} = \max_{i \neq j} [\alpha_{ij}]$$

$$\beta_{max} = \max_{i \neq j} [\beta_{ij}]$$

$$\gamma_{max} = \max_{i \neq j} [\gamma_{ij}]$$

但し、 $\max_{i \neq j} [A_{ij}]$ は $i \neq j$ なる全ての A_{ij} における最大値とする。

また、 α_{max} 、 β_{max} 、 γ_{max} は、

$$\alpha_{max} \ll \gamma_{max} < \beta_{max}$$

なる特性を有する系列とする。

【0027】このように拡散された情報は、変調部16₁～16₄においてケーブルや無線伝送が可能なように変調され、可変利得部17₁～17₄において各々の情報の重要性に基づいて各送信電力が調整され、加算器18において加算される。

【0028】以上の処理によりCDMA拡散されたN-1種類の映像情報は、CDMA拡散部12_nから出力される同期情報に係る拡散・変調信号とともに、信号加算部13で加算され、ケーブル14から出力される。

【0029】一方、図2にこのように拡散された情報を受信するユーザ側の受信機の構成を示す。すなわち、同図に示すように、ケーブル14より入力した拡散された

*【0023】CDMA拡散部12_nは、同期情報に対して拡散系列 v_n で拡散を行う直接拡散処理部19と、拡散した情報を変調してケーブルや無線伝送を可能にする変調部20と、この変調情報を一定の電力に増幅する増幅部21とを備える。

【0024】各映像情報は、階層化部11₁～11_{n-1}により各々基本情報と品質向上情報に階層化され、各CDMA拡散部12₁～12_{n-1}に入力される。ここで、例えばi番目の映像情報は、固定レート（例えば1Mbps）の基本情報 x_{i0} と1Mbpsで可変の品質向上情報 $x_{i1} \sim x_{i4}$ からなる。品質向上情報は、映像情報の可変レート性により、存在しない時（0bps）から全情報が発生する時（4Mbps）まで変化する。

【0025】これらの映像情報において、品質を確保するために最低限必要な情報である基本情報は、直接拡散処理部15₁において拡散系列 v_i で例えば128倍（128Mbps）に拡散される。一方、品質向上情報 $x_{i1} \sim x_{i4}$ は、直接拡散処理部15₁～15₄において拡散系列 $w_{i1} \sim w_{i4}$ で例えば128倍（0～128Mbps）に拡散される。

【0026】ここで、拡散系列 v_i は、直交性の強い系列であり、拡散系列 $w_{i1} \sim w_{i4}$ は、拡散系列 v_i に比し、直交性は弱い、多重度の高い系列である。すなわち

$$w_{i1}^T w_{i1} = \alpha_{i1}$$

$$w_{i1}^T w_{i2} = \beta_{i1}$$

$$w_{i1}^T w_{i4} = \gamma_{i1}$$

とし、

各種の映像情報は、復調部22₁～22₄により復調され、逆拡散部23₁～23₄でユーザ固有の逆拡散系列 v_{i1} 、 $w_{i11} \sim w_{i14}$ 、 v_n を用いて復号される。

【0030】これらの復号信号のうち、拡散系列 v_i で逆拡散された基本情報および拡散系列 $w_{i1} \sim w_{i4}$ で逆拡散された品質向上情報は、階層化した映像符号器24で復号され、所望の映像25となる。

【0031】また、逆拡散系列 v_n で逆拡散された同期情報（タイミング情報）は、受信機全体のタイミングを調節するために用いられる。以上の処理により、図3に示すように、同一帯域W上での基本情報と品質向上情報の柔軟な多重化が可能になる。

【0032】なお、上述した実施例では、基本情報と品質向上情報を同一の帯域としたが、帯域に余裕がある場合には、図4に示すように異なる帯域に分けることも

可能である。ここで、基本情報は帯域 W_b において多重化伝送され、品質向上情報は帯域 W_u において多重化伝送される。この場合、品質向上情報は、多重度の高い拡散系列を用いるため、基本情報より少ない帯域中で映像情報を伝送できる可能性がある。

【0033】また、CDMAの特徴を生かすことにより既存放送波と帯域を共有することも可能である。このような一例として、基本情報を従来の時分割多重(TDMA)方式で多重化し、品質向上情報のみをCDMA多重化することが考えられ、この場合も本発明の範囲にある。

【0034】さらに、上述した実施例では、映像情報を例に説明したが、階層化可能な情報なら音声でも同様に本発明を適用できる。また、上述した実施例では通信を例にして説明したが、情報の蓄積を行う場合にも勿論本発明を適用できる。

【0035】

【発明の効果】以上詳述したように、本発明によれば、基本的に必要とされる一定の品質を維持することができ、また統計的多重化効果による伝送レートの低減化を図ることができる。

【0036】また、重要度に応じて各品質向上情報の送信電力を変化させることにより、これらに情報の誤り率(品質)を柔軟に設定することができる。さらに、基本*

* 情報と品質向上情報との割合をコード分割多重に用いる拡散コードの種類を変化させるだけで柔軟に変化させることができる。また、無線伝送時のフェージングに強く、移動体通信に有利な条件となる。

【図面の簡単な説明】

【図1】本発明の一実施例に係るシステムにおける送信装置の構成を示すブロック図である。

【図2】本発明の一実施例に係るシステムにおける受信装置の構成を示すブロック図である。

10 【図3】同一帯域に基本情報と品質向上情報とを多重化した例を示す図である。

【図4】異なる帯域に基本情報と品質向上情報とを多重化した例を示す図である。

【図5】CATVシステムの構成例を示す図である。

【図6】シーンチェンジ時のビットレートの変動を説明するための図である。

【符号の説明】

11₁ ~ 11_{N-1} ... 階層化部

12₁ ~ 12_{N-1} ... CDMA 拡散部

20 13 ... 信号加算部

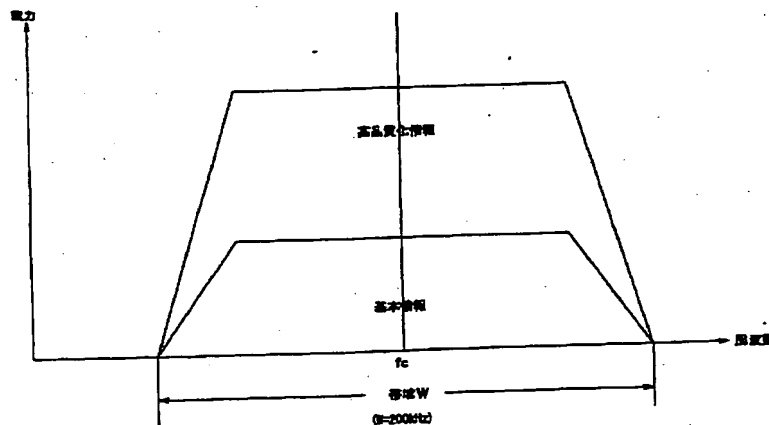
15₁ ~ 15_N ... 直接拡散処理部

16₁ ~ 16_N ... 変調部

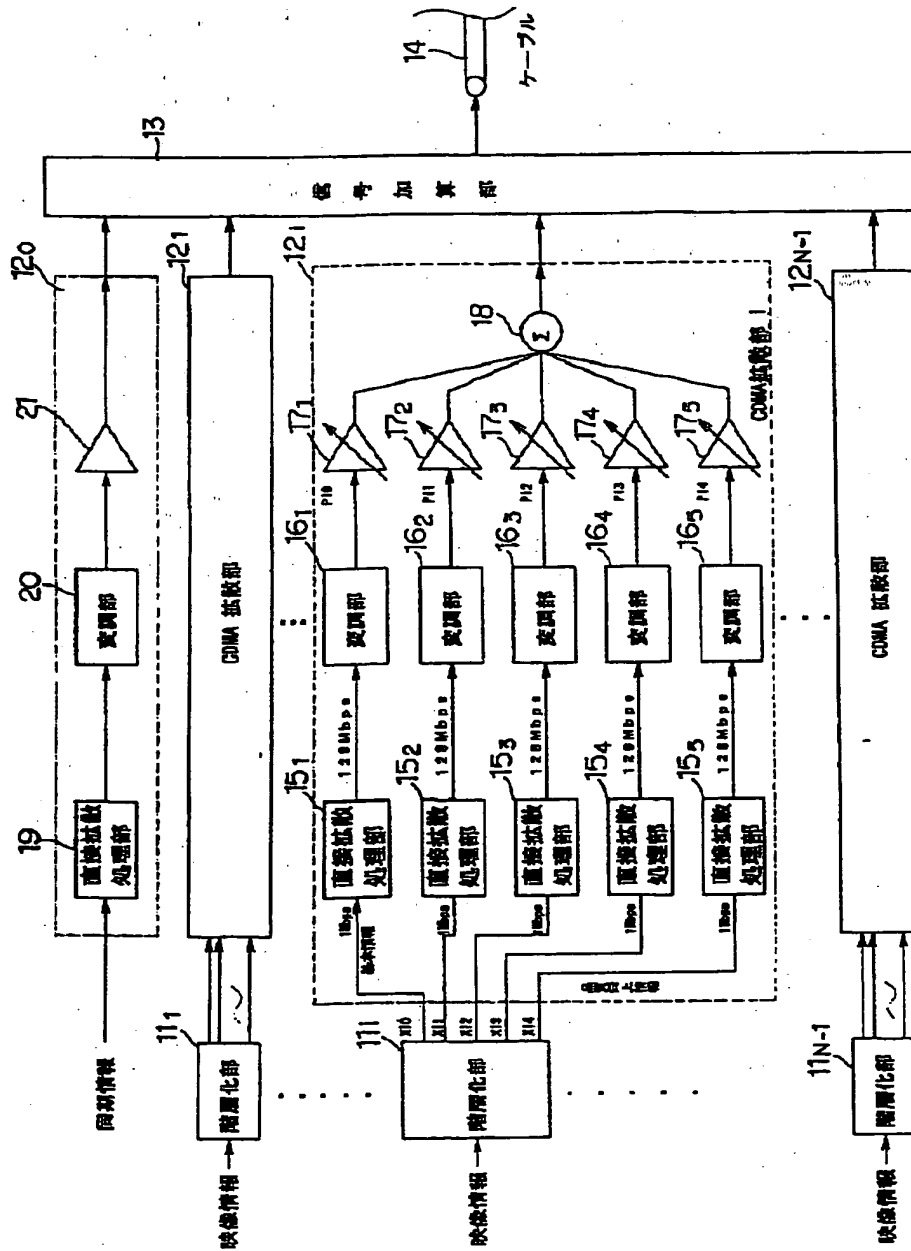
17₁ ~ 17_N ... 可変利得部

18 ... 加算器

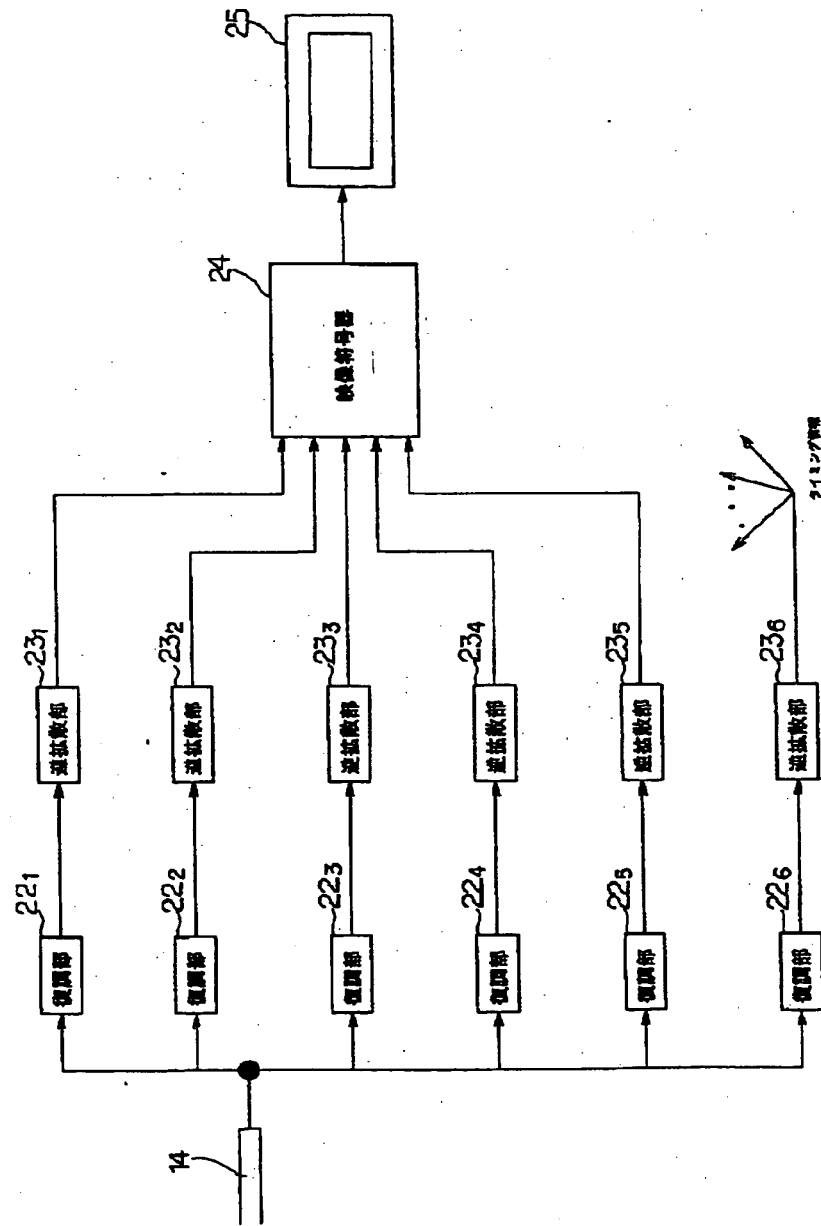
【図3】



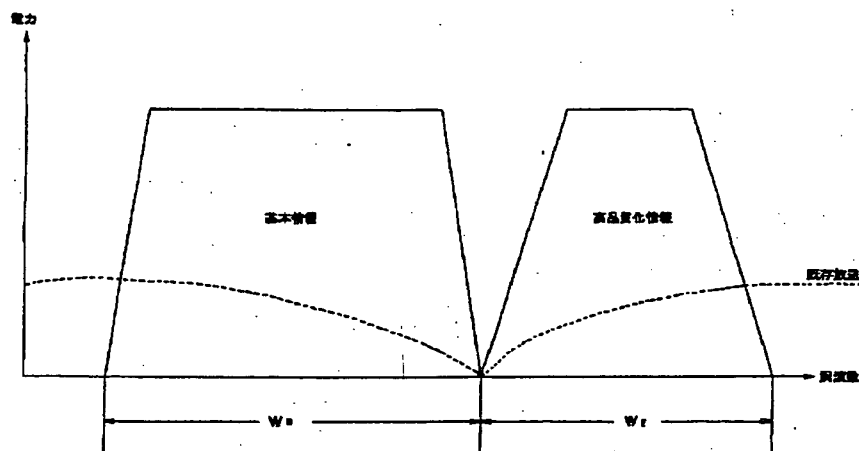
【図1】



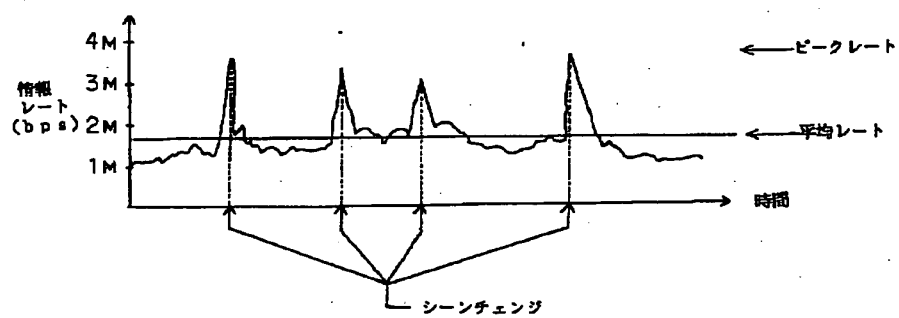
【図2】



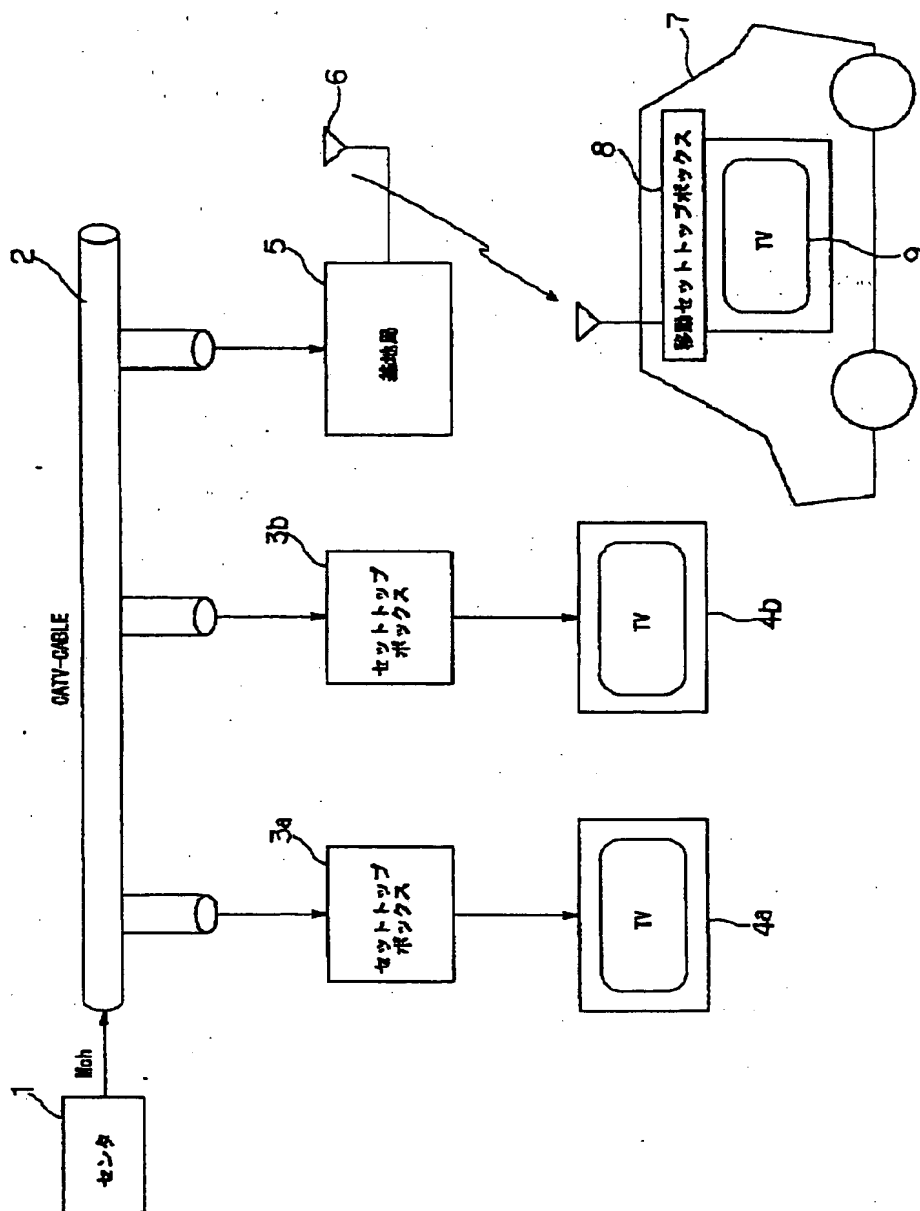
【図4】



【図6】



【図5】



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